Claims

1. A method for detecting a pulldown technique comprising:

sequentially comparing adjacent pairs of frames of a video sequence to detect relatively high frequency and relatively low frequency components of said adjacent pairs of frames; and

determining that the video sequence was produced by a 3:2 pulldown technique when a repeating pattern of said adjacent pairs is high/low/high/low/low.

2. The method of claim 1 further comprising determining that the video sequence was produced by a 2:2 pulldown technique when the repeating pattern is high/low/high/low.

3. A method for determining a noise level in a 3:2 pulldown detection system comprising:

detecting a plurality of relatively low field difference values among a larger plurality of field difference values in a video stream created by a 3:2 pulldown technique; and

using said plurality of detecting low field difference values to estimate a noise level of said video stream.

4. The method of claim 3 wherein the detection of the plurality of low field difference values further comprises detecting first, second and third sequential low field difference values.

5. The method of claim 4 wherein the first and second low field difference values are grouped into a first set and the second and third low field difference pairs are grouped into a second set.

6. The method of claim 5 wherein a first differential magnitude is calculated between the first set of low field difference values and a second differential magnitude is calculated between the second set of low field difference values.

7. The method of claim 6 wherein the noise level is equated to the third sequential low field difference value if the first and second differential magnitudes are of the same sign.

8. The method of claim 6 wherein the noise level is equated to the average of the second sequential low field difference value and the third sequential low field difference value if the first and second differential magnitudes are of opposite signs.

9. A method for dynamically determining threshold detection levels in a pulldown detection system comprising:

detecting a noise level in a video stream created by a pulldown technique; and

dynamically adjusting a threshold detection level based upon said detected noise level and said video stream.

10. The method of claim 9 wherein the threshold detection level is determined by:

determining that the pulldown technique is 3:2;

determining if a current field difference value is low or high; and

calculating the new threshold detection level based on the current field difference value and a plurality of prior field difference values.

11. The method of claim 10 wherein the calculating of the new threshold value for the high field difference value comprising:

subtracting the noise level from the current field difference value and the previous four field difference values resulting in five substracted values;

summing up the five substracted values;

dividing the sum by a scale factor based upon the noise level; and

adding the noise level.

12. The method of claim 10 wherein the calculating of a new threshold value for the low field difference value comprising:

subtracting the noise level from the current field difference value and the previous four field difference values resulting in five subtracted values;

summing up the five subtracted values;

dividing the sum by a scale factor based upon the noise level;

multiplying by 2; and

adding the noise level.

13. The method of claim 9 wherein the threshold detection level is determined by:

determining that the pulldown technique is 2:2;

obtaining a first, second and third previous frequency detection value; and

calculating a new threshold detection level based on the first, second and third previous frequency detection values.

14. The method of claim 13 wherein the calculating of the new threshold detection level comprising:

verifying that a 2:2 pulldown lock has not occurred;

verifying that the first and third previous frequency detection values are low;

obtaining an average the first and third previous detection values;

obtaining the magnitude of the difference between the average and the second previous frequency detection value;

dividing by 2 ; and

adding to an immediately preceding calculated threshold value.

15. The method of claim 13 wherein the calculating of the new threshold detection level comprising:

verifying that a 2:2 pulldown lock has not occurred;

verifying that the first and third previous frequency detection values are high;

obtaining an average the first and third previous detection values;

obtaining the magnitude of the difference between the average and the second previous frequency detection value;

dividing by 2 ; and

subtracting from an immediately preceding calculated threshold value.

16. The method of claim 13 wherein the calculating of the new threshold detection level comprising:

verifying that a 2:2 pulldown lock has occurred;

verifying that the first and third previous frequency detection values are low;

obtaining an average the first and third previous detection values;

obtaining the magnitude of the difference between the average and the second previous frequency detection value;

dividing by 4 ; and

adding to an immediately preceding calculated threshold value.

17. The method of claim 13 wherein the calculating of the new threshold detection level comprising:

verifying that a 2:2 pulldown lock has occurred;

verifying that the first and third previous frequency detection values are high;

obtaining an average the first and third previous detection values;

obtaining the magnitude of the difference between the average and the second previous frequency detection value;

dividing by 4 ; and

subtracting from an immediately preceding calculated threshold value.

18. A method for processing a progressive source interlaced video stream comprising:

deinterlacing said interlaced video stream to create a progressive video stream;

determining a confidence level with respect to said progressive video stream; and

post processing said progressive video stream based upon said determined confidence level.

19. The method of claim 18 wherein said confidence level is below about said first threshold, no action is taken to improve the video sequence.

20. The method of claim 19 wherein said confidence level is above about a first threshold but below about a second threshold, an interlace artifact removal process is initiated.

21. The method of claim 20 wherein said confidence level is above said second threshold, the video source is processed as a non-progressive source.

22. The method of claim 18 where said post processing is determined by combining at least two of the following elements:

a field difference pair history value;

a field difference noise filter low threshold value;

a source type transition type count value;

a sequence of frequency detection values; and

a ratio of high to low frequency detection values.

23. A method for detecting source-type sequence breaks in a video stream comprising:

sequentially comparing adjacent pairs of frames of a video sequence to detect relatively high frequency and relatively low frequency components of said adjacent pairs of frames; and

detecting source-type sequence breaks by analyzing a pattern of said high and low frequency components.

24. The method of claim 23 wherein the detection of source-type sequence breaks comprises:

obtaining a frequency detection value;

calculating a sum of a number of previous frequency detection values;

determining that a source-type sequence break has occurred if the frequency detection value is greater in magnitude than the sum and the frequency detection value is greater than a given threshold.

25. The method of claim 23 wherein the detection of source-type sequence breaks comprises:

obtaining a frequency detection value;

obtaining a field difference value;

calculating a sum of a number of previous field difference values;

comparing the frequency detection value with two previous frequency detection values; and

determining that a source-type sequence break has occurred if the field difference value is larger than the sum and larger than a given threshold and the frequency detection is larger than the two previous frequency detection values.

26. The method of claim 23 wherein the detection of source-type sequence breaks comprises:

obtaining a high magnitude frequency detection value;

obtaining a low magnitude frequency detection value;

calculating an average of a number of previous frequency detection values;

comparing the high magnitude and low magnitude frequency detection values with the average; and

determining that a source-type sequence break has occurred if the high magnitude frequency value is less than the average or the low magnitude frequency detection value is greater than the average.

27. A deinterlacing system which converts an interlaced video stream into a progressive video stream comprising:

a) a field assembly responsive to a last field, a next field, a current field and progressive source phase and operative to develop a progressive output frame;

b) a source detection module responsive to last, next and current fields and operative to develop a progressive source phase and a progressive source detected; and

c) an intra-frame deinterlacer responsive to the progressive output frame and the progressive source detected and operative to develop a progressive frame output.

28. The deinterlacing system of claim 27, further comprising an interlace artifact post-processing developed by the source detection model and sent to the intra-frame deinterlacer.

29. The deinterlacing source detection module of claim 27 further comprising:

a frequency detection module responsive to the next field and the current field and operative to develop a frequency detection sum;

a field differencing module responsive to the next field, the last field and a noise filter control and operative to develop a field difference sum; and

a progressive source pattern/quality detector responsive to the field difference sum and frequency detection sum and operative to develop the progressive source phase, the progressive source detected, the interlace artifact post-processing and the noise filter control.

30. A video system which converts an interlaced video stream into a progressive video stream comprising:

a) an interlaced signal source;

b) a buffer having an input coupled to an output of the interlaced signal source;

c) a deinterlacer having an input coupled to an output of the buffer;

d) a display driver having an input coupled to an output of the deinterlacer;

e) a display driver having an input coupled to an output of the deinterlacer; and

f) a raster display having an input coupled to an output of the display driver.

31. The video system of claim 30 wherein the interlaced signal source is derived from an analog signal.

32. The video system of claim 30 wherein the interlaced signal source is derived from a digital signal.